

## CORRESPONDENCE/MEMORANDUM

DATE: July 6, 199955 071 00023  
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PRELIMINARY STACK TEST REVIEW

Received: 7/2/99

By: Jeannine CampionTest Date: June 17, 1999Name of Source: Rockwell Lime, N/AFID #: 436-034-390Address: 4110 Rockwood RdStack #: S11City: Manitowoc, WI 54220-9619Process #: P36Permit #: 93-RV-108Date Issued: February 7, 1995Description of Source Tested: Lime Kiln #2Description of Control Equipment: BaghouseTest Firm: Clean Air EngineeringCrew Chief & Phone#: Peter Kalymann (847) 991-3300Pollutant Tested: PMTest Method: 5/202

Pollutant Tested: \_\_\_\_\_

Test Method: \_\_\_\_\_

Pollutant Tested: \_\_\_\_\_

Test Method: \_\_\_\_\_

Test Production Level: 25.46 tons of stone feedRated Production Level: 25 tons of stone feed

## Discussion of Results:

Poll. Test Ave. = 0.021 lb/ton stone Limit = 0.30 lb/ton stoneIn Compliance? ☒ Y ☐ N

Poll. Test Ave. = \_\_\_\_\_ Limit = \_\_\_\_\_

In Compliance? Y ☐ N

Poll. Test Ave. = \_\_\_\_\_ Limit = \_\_\_\_\_

In Compliance? Y ☐ N

Poll. Test Ave. = \_\_\_\_\_ Limit = \_\_\_\_\_

In Compliance? Y ☐ NIs This a Valid Test? ☒ Y ☐ N If answer is no, please indicate the reason.

\* Test may be reviewed in depth later, if necessary.

CC Joe Perez - AM/7  
US EPA Region V



## PROJECT OVERVIEW

1-1

Rockwell Lime Company contracted Clean Air Engineering to perform particulate testing at their facility located in Manitowoc, Wisconsin for compliance demonstration.

The test parameters included the following pollutants:

- Total suspended particulate (TSP).

Prior to the sampling, the alternative measurement site selection procedures (Section 2.5 of EPA Method 1) was performed to determine the presence of cyclonic flow. EPA Method 202 was performed as per the method since the 3D measurement indicated no cyclonic flow.

The testing was conducted place at the No. 2 Kiln Baghouse Stack on June 18, 1999. Coordinating the field testing were:

Don Brisch - Rockwell Lime  
Peter Kaufmann - Clean Air Engineering

Observing the metals testing was:

Jeannine M. Campion- Wisconsin DNR

The schedule of activities shown in Table 1-1. A summary of the results is presented in Table 1-2 on page 1-2.



## PROJECT OVERVIEW

1-2

**Table 1-1:**  
**Schedule of Activities**

<u>Date(1999)</u>	<u>Start Time</u>	<u>Stop Time</u>	<u>Unit</u>	<u>Location</u>	<u>Pollutant</u>	<u>Method</u>	<u>Run No.</u>
<u>June 18</u>							
	08:00	09:05	Kiln #2	Stack	Particulate	EPA 202	1
	09:25	10:27	Kiln #2	Stack	Particulate	EPA 202	2
	10:49	11:51	Kiln #2	Stack	Particulate	EPA 202	3

**Table 1-2:**  
**Summary of Test Results**

<u>Source</u>	<u>Sampling Method</u>	<u>Average Emission</u>
<u>Constituent (Units)</u>		
<u>Kiln #2</u>		
Particulate (lb/hr)	EPA M202	0.52
Particulate (lb/ton stone)	EPA M202	0.021
<u>Source</u>	<u>Sampling Method</u>	<u>Resultant Angle</u>
<u>Constituent (Units)</u>		
Cyclonic Flow (Resultant angle)	EPA M1 Sect 2.5	6.2

The test conditions and results of analysis are presented in Table 2-1 on page 2-1.



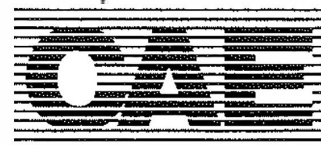
## RESULTS

2-1

**Table 2-1:**  
**Kiln #2, Baghouse Stack - Particulate**

Run No.	1	2	3	Average
Date (1999)	June 18	June 18	June 18	
Start Time (approx.)	08:00	09:25	10:49	
Stop Time (approx.)	09:05	10:27	11:51	
<b>Process Conditions<sup>1</sup></b>				
Stone Feed (tons)	25.74	25.24	25.44	25.47
Stone Feed (ton/hr)	24.13	24.43	25.02	24.53
<b>Gas Conditions</b>				
O <sub>2</sub> Oxygen (dry volume %)	7.1	7.3	7.3	7.2
CO <sub>2</sub> Carbon dioxide (dry volume %)	21.2	21.2	21.3	21.2
T <sub>s</sub> Temperature (°F)	419	420	426	422
B <sub>wo</sub> Moisture (volume %)	7.82	8.04	7.97	7.94
<b>Volumetric Flow Rate</b>				
Q <sub>a</sub> Actual conditions (acfm)	49,920	51,300	48,050	49,760
Q <sub>std</sub> Standard conditions (dscfm)	27,280	27,930	26,000	27,070
<b>Front Half Particulate</b>				
C Concentration (gr/acf)	0.00071	0.00011	0.00017	0.00033
C Concentration (gr/dscf)	0.0013	0.00020	0.00031	0.00060
E Emission rate (lb/hr)	0.31	0.047	0.069	0.14
E Emission rate (lb/ton stone)	0.013	0.0019	0.0027	0.0058
<b>Back Half Particulate</b>				
C Concentration (gr/acf)	0.0005	0.0003	0.0019	0.0009
C Concentration (gr/dscf)	0.0010	0.0005	0.0035	0.0017
E Emission rate (lb/hr)	0.22	0.119	0.79	0.38
E Emission rate (lb/ton stone)	0.0093	0.0049	0.031	0.015
<b>Total Particulate</b>				
C Concentration (gr/acf)	0.0012	0.00038	0.0021	0.0012
C Concentration (gr/dscf)	0.0023	0.00069	0.0038	0.0023
E Emission rate (lb/hr)	0.53	0.17	0.85	0.52
E Emission rate (lb/ton stone)	0.022	0.0068	0.034	0.021

<sup>1</sup> Process conditions supplied by Rockwell Lime Company personnel.



# Rockwell Lime Company

Manufacturing Data Compiled During CAE's Stack Test on #2 Kiln

## Articulate Test

Test Run	Date	Time	Nat. Gas (CF)	Coal/Coke Blend (Lbs)	Stone Feed (Tons)	Baghouse Pressure Differential Readings Across Each Compartment							
						#1	#2	#3	#4	#5	#6	#7	#8
1	08/18/99	08:01 am - 09:05 am	22,800	5,338	25.74	4.1	Off	3.8	4.8	Off	4.5	Off	4.1
2	08/18/99	09:25 am - 10:27 am	22,300	5,268	25.24	5.2	Off	5.1	5.3	Off	4.2	Off	4.5
3	08/18/99	10:49 am - 11:50 am	22,500	5,317	25.44	4.3	Off	4.0	5.5	Off	4.9	Off	3.9

Opacity CEM read "0-3%" throughout the entire test.  
Baghouse Inlet pressure during tests ranged between 6.3" - 7.0"

08/18/99 FRI 15:34 FAX 920 682 7972

ROCKWELL LIME

002

# PARTICULATE CHECKLIST

Name of Source: Rockwell Lime Test Date: June 17, 1999

1. Are the isokinetics per run between 90 and 110%? YES ☒ NO ☐  
If the  $\chi^2$  for a run is outside the range, void the run. See 5.
2. Is the sample volume per run  $\geq 30$  DSCF? YES ☒ NO ☐  
If the sample volume for a run is  $< 30$  DSCF, void the run. See 5.
3. Is the sample time per run  $\geq 60$  min.? YES ☒ NO ☐  
If the sample time for a run is  $< 60$  min., void the run. See 5.
4. Is the sample time per sample point  $\geq$  two min.? YES ☒ NO ☐  
If the sample time per point for a run is  $< 2$  min., void the run. See 5.
5. A stack test shall consist of three valid runs or, at a minimum, two valid runs if one run is voided. Is this a valid test? YES ☒ NO ☐  
If no, inform the District or the source that the test is unacceptable and should be redone. Your review is over.
6. Is the total particulate per run added correctly? YES ☒ NO ☐  
If an incorrect total is found, correct the total and the results or call the consultant and ask for a correction.
7. Was the backhalf included in the total particulate? YES ☒ NO ☐  
NSPS sources are exempt from including the backhalf. All other sources must include the backhalf. If they don't, the test is invalid. See 5.

Eq. 1  $Gr/DSCF = 15.43 \times g \text{ of part./sample volume of run in DSCF}$

Eq. 2  $Gr/DSCF @ 12\% CO_2 = (Gr/DSCF) \times 12 / \text{Stack } CO_2$

Eq. 3  $Gr/DSCF @ 7\% O_2 = (Gr/DSCF) \times (20.9 - 7) / (20.9 - \text{Stack } O_2)$

Eq. 4  $Lb/DSCF = (Gr/DSCF) / 7000$  Eq. 5  $Lb/MLb_{DRY} = 385.6 \times 10^3 \times (Lb/DSCF) / MW_{DRY}$

Eq. 6  $Lb/MLb_{WET} = 385.6 \times 10^3 \times (Lb/DSCF) \times (1 - (\% \text{ Moisture} / 100)) / MW_{WET}$

Eq. 7  $Lb/Hr = 60 \times DSCFM \times (Lb/DSCF)$  Eq. 8  $Lb/10^6 \text{ BTU} = (Lb/Hr) / (10^6 \text{ BTU/Hr})$

Eq. 9  $Lb/10^6 \text{ BTU} = (Lb/DSCF) \times F \text{ Factor} \times 20.9 / (20.9 - \text{Stack } O_2)$

8. If the emission limit is in Gr/DSCF, Lb/DSCF, Lb/MLb, Lb/Hr or Lb/ $10^6$  BTU, solve the needed Eq. Do your results match the consultant's? YES ☒ NO ☐  
If no, fix the problem or call the consultant for a correction.
9. Is the three run (or two run) average correct? YES ☒ NO ☐  
If no, write in the correct average.
10. Is the average result in compliance? YES ☒ NO ☐  
If no, the District should issue an NOV.
11. Was the source operating at a level representative of full capacity? YES ☒ NO ☐  
If no, the permit release may need to provide conditions to cap the source at the test level until a stack test at a higher production level (showing compliance) is performed. If the test was not for permit release, other actions may be warranted.





S11/P36				
Method 5/202 - Particulates				
Run: 1      Run: 2      Run: 3				
Barometric Pressure (PB):	29.55	29.55	29.55	Inches Hg
Stack Static Pressure:	-0.1	-0.1	-0.1	Inches H2O
Stack Pressure (PS):	29.54	29.54	29.54	Inches Hg
Orifice Pressure (OP) or delta H:	1.10	1.17	1.01	Inches Hg Abs.
Volume H2O CONDENSED (VLc):				mL condensed
Volume H2O in SILICA GEL (VLsg):	60.3	63.2	58.4	mL in silica gel
Total Volume H2O in impingers (VL):	60.3	63.2	58.4	mL total
Total particulate mass (MT):	0.0049	0.0015	0.0079	Grams
Test Time (T):	60	60	60	Minutes
Number of Points:	24	24	24	Points
Time per point:	2.5	2.5	2.5	Minutes
% O2:	7.1	7.3	7.3	%
% CO2:	21.2	21.2	21.3	%
% N2:	71.7	71.5	71.4	%
Pitot tube coefficient (CP):	0.84	0.84	0.84	(dimensionless)
Stack Temperature Avg. (TS):	419	420	426	Deg. F
Stack Temperature (TS): Rankine	879	880	886	Deg. R
Meter Temperature Avg. (TM):	84	92	96	Deg. F
Meter Temperature (TM): Rankine	544	552	556	Deg. R
Gas Meter Volume (VM):	34.92	36.06	33.88	Cubic Feet
Nozzle Diameter:	0.32	0.32	0.32	Inches
Nozzle Area (AN):	5.59E-04	5.59E-04	5.59E-04	Square Feet
Stack Area (AS):	27.49	27.49	27.49	Square Feet
Dry Gas Meter correction factor (Y):	0.9973	0.9973	0.9973	(dimensionless)
F-factor:				DSCF/10^6 BTU
Sqr Rt Velocity Pressure Avg (VP^0.5):	0.42	0.43	0.40	Inches H2O
Heat Input (H):				MMBTU/Hr

Dry Gas Meter Volume (VMSTD):	33.5	34.0	31.8	Dry Standard Cubic Feet
Condensed H2O Volume (VWSTD):	2.843	2.980	2.754	Wet Standard Cubic Feet
% Moisture:	7.8	8.0	8.0	%
Mole Fraction (MD):	0.922	0.920	0.920	Fraction
Dry Molecular Weight (MWD):	31.7	31.7	31.7	Lb/Lb-mole dry stack gas
Wet Molecular Weight (MWS):	30.6	30.6	30.6	Lb/Lb-mole wet stack gas
Stack Gas Velocity Avg (VS):	29.4	30.2	28.3	Feet/Second
Actual Stack Flow Rate (QACT):	48532	49868	46709	ACF/M
Dry Stack Flow Rate (QSTD):	26517	27154	25280	DSCF/M
% Excess Air	60	63	63	%
Part. Mass Rate-Areas Method (PMRA):	0.53	0.16	0.86	Lbs/Hr
Part. Mass Rate-Conc. Method (PMRC):	0.51	0.16	0.83	Lbs/Hr
Part. Mass Rate-Average (PMRAVG):	0.52	0.16	0.84	Lbs/Hr
Part. Emission Concentration (C):	0.0023	0.0007	0.0038	GR/DSCF
Dry Stack Gas Mass Flow Rate (DGR):	130703	133874	124698	lbs. of dry gas/hr
Emission Rate Avg-dry gas (LB/MLBD):	0.004	0.001	0.007	lb/10^3 lb of dry gas
Wet Stack Gas Mass Flow Rate (WGR):	126363	129301	120475	lb of wet gas/hr
Emission Rate Avg-wet gas (LB/MLBW):	0.004	0.001	0.007	lb/10^3 of wet gas
% Isokinetics (90% < Iso < 110%)	103.5	102.8	103.1	%



Method 5/202 - Particulates			Checklist
	Run: 1	Run: 2	Run: 3
Isokinetics	Good	Good	Good
Sample Volume (dsct)	Good	Good	Good
Sample Time	Per run:	Good	Good
	Per point:	Good	Good
Operating at Full Capacity?	Yes	Yes	Yes
Compliance	No		unknown unit

Permit # and Date	93-RV-108	2/7/95
Limit or Regulation	0.300	lb/ ton of stone feed

<i>Production Data:</i>			
Rated Full Capacity	25		
	tons of stone feed		
Operating Rate during test	25.74	25.22	25.44
	tons of stone feed		
Percent of Full Capacity	103.0	100.9	101.8
	% of rated full capacity		

Compliance determination for PM:

Run #1: 0.022 lb PM/ton stone feed

Run #2: 0.0068 lb PM/ton stone feed

Run #3: 0.034 lb PM/ton stone feed

Average: 0.021 lb PM/ton stone feed

